pierced the capsule, are accompanied as far as their insertion by sheath-like processes derived from it, has, owing to these descriptions, maintained itself in ophthalmology even up to this time, and has served as a basis for explanations of the effect of the tenotomy, the difference between the old and modern mode of operating, etc. This idea is, however, erroneous; for these sheath-like processes do not exist at all. But, as has been already mentioned, the anterior half of the capsule of Tenon certainly adheres to the external surface of the muscle and is intimately connected with it. On the other hand, the conjunctiva is here also tolerably firmly connected with the capsule, as far as a somewhat irregularly circular line, which may be recognized by the fact that it lies at the bottom of a furrow when the eye is moved in an eccentric direction. The formation of this furrow prevents the sinking and tilting forwards of the conjunctiva, which would otherwise occur near the caruncle, as, for instance, when the eye looks far inwards.

"From this marginal line, the connection between the capsule of Tenon and the conjunctiva becomes quite lax. One portion of the connective tissue, which composes the anterior half of the capsule, is reflected, and passes over into the submucous tissue of the eyelids; another portion attaches itself to the edge of the posterior half of the capsule, in order thus to close the latter. These two halves do not really pass perfectly over into one another, inasmuch as the edge of the posterior half of the capsule is partly continued into the band-like adhesions between it and the edge of the orbit."

2. *New Lingual Muscle.*—BOCHDALEK, Jr., describes a new small muscle of the tongue, extending longitudinally in the middle line between the two genio-hyo-glossi.—*Reinhert und Du Bois Raymond's Archiv,* 1866, from *Journal Anatomy and Physiology,* No. II.

3. *Professor Parkes's Recent Experiments "On the Elimination of Nitrogen by the Kidneys and Intestines during Rest and Exercise on a Diet without Nitrogen."*—These experiments were conducted at the Netley Hospital, and were originally undertaken "to test the results arrived at by Prof. Fick and Wislicenus with respect to the elimination of nitrogen during exercise on a non-nitrogenous diet, as recorded in the *Philosophical Magazine* for June, 1866 (supplement)." Their conclusions were in brief as follows:—

The question at issue was, whether muscular power is the result of the oxidation of actual muscular substance, or of the elements of the food after absorption, but before conversion into organized tissue; and the object of the experiment was to determine the ratio existing between the waste of the tissues produced by a given amount of mechanical work, and the calculated amount of force to be obtained from the oxidation of so much matter. For it is evident, that should these two quantities prove to be not related to one another, the waste of the tissues must not be taken as the equivalent of the amount of work done.

To determine this point, the Professors, having abstained for a given period from meat, bread, cheese, milk, and, in short, from all food containing nitrogenous principles, carefully estimated the amount of nitrogen excreted during their ascent of a mountain, which happened to present unusual facilities for the purpose; and they found that, after making ample allowance for errors of observation, "scarcely one-fifth of the actual energy required for the work performed could have been obtained from the amount of muscle consumed," the remaining four-fifths having been supplied by the elements of the non-nitrogenous diet taken during the period.

These conclusions, although supported in the main by the results obtained by other observers, have been objected to on the ground of the very short period over which the observations extended, and on account of the intestinal excreta not having been considered. It was with the view of testing the value of these objections that Dr. Parkes undertook the present series of investigations.

The experiments were made upon two perfectly healthy soldiers, of steady and regular habits; one of them, S., was a young, strong, active adult; the other, T., the senior by several years, was a small spare man, but well proportioned and active. Every care seems to have been taken to insure the most accurate results. The whole period of eighteen days, over which the observations extended, was divided into five periods, as follows:—

First, a period of six days, during which the men ate a regulated diet, consisting of—

| | S. | | T. |
|---|---|---|---|
| Cooked meat . . . . . . | 7.625 | oz. avd. | 7.625 |
| Bread . . . . . . . | 16.66 | " | 16.26 |
| Vegetables (¾ potatoes, ¼ cabbage) . | 13,87 | " | 13. |
| Butter . . . . . . . | 1. | " | 1. |
| Tea (milk 3 oz., sugar 1½ oz.) . . | 20. | " | 20. |
| Coffee do. . . | 20. | " | 20. |
| Beer . . . . . . . | 15. | " | 15. |
| Water . . . . . . . | 5.8 | " | 2.33 |
| Salt . . . . . . . | 5. | " | .33 |

and performed their ordinary work. During this period all the variations in their weight, and in the amount and character of their egesta were carefully noted, in order to form a standard of comparison.

Secondly, a period of two days of abstinence from meat, bread, milk, and all nitrogenous food, but with the most complete rest from muscular activity.

Thirdly, a period of four days, during which they returned to their former diet and occupation, in order that they might regain their normal standard.

Fourthly, a period of two days of abstinence from nitrogenous food, but during which they took a very considerable amount of exercise.

Fifthly, a period of four days of their regulated diet and occupation, in order that the effect of the last period might be fully noted.

During the first period it was found that nutrition proceeded with the most perfect regularity, and the excreta (both urinary and intestinal) proved to be perfectly normal. The amount of food was almost the same in each case, as may be seen from the table, with the exception that the bigger man took nearly twice as much water as the other; the smaller man, therefore, took more solid food in proportion to his body-weight than the bigger man did. The proportion existing between the amount of nitrogen excreted and the weight of the body was identical in the two cases, showing, as Dr. Parkes says, "that a real connection must exist between body-weight and urinary excretion." As might have been expected, the smaller man, T., passed more nitrogen in his intestinal excreta than the other did, since he ate the same amount of food and lost less in his urine.

*Second Period.*—The men were now placed upon a diet consisting of

Arrowroot (cakes and jelly);
Butter (containing no casein);
Sugar; and
Tea without milk.

The quantity was left to choice and appetite. Both took more water than formerly. They were confined to their room, and remained sitting still or lying in bed the whole time. Both lost weight—S. rather more than 2½ lbs., and T. about 1¾ lb.

The results of the urinary analysis, when summed up, amount to this—that, on the mean of the two days, the urea excreted during the first twenty-four hours was only about one-half of what it had been before, whilst during the last twelve hours it was in each case only one-third of the normal quantity. The total amount of nitrogen excreted varied in much the same proportion. On comparing the relation borne by the excreted nitrogen to the body-weight, it was found that the tissues of the older and smaller man furnished a slightly greater amount than those of the younger man; and this statement holds good both as regards the nitrogen contained in the urea and the other excreta.

*Third Period.*—The men at the close of this period had regained what they had lost during the previous two days in body-weight, and had, in other respects, returned to their normal standard.

With regard to the excreta, it was found that a certain proportion of the nitrogen of the food was retained in the body to make up for the previous deficiency, and to enable the tissues to recover that reserve fund of nutriment which had been so largely drawn upon. In the case of S. the amount of nitrogen retained represented one-fourth, and in the case of T. nearly one-third, of the whole quantity taken.

*Fourth Period.*—The men were again reduced for two days to the same non-nitrogenous diet as before during the second period. They ate more this time; their hunger was satisfied, but they complained of the monotony of the diet. They now took active exercise, walking on level ground at intervals during the day, after which they went to bed. On the first day they walked 23.76 miles, which, when calculated as work done, may be represented on Dr. Haughton's plan as follows:—

S. lifted 453.6 tons one foot
T. " 346.74 tons "

On the second day they walked 32.78 miles: *i. e.*,

S. lifted 625.8 tons one foot
T. " 475. " "

"The first day's walking was done pretty well by both men. On the second day both did the first twenty miles well, but felt very much fatigued during the last thirteen miles. During the last four miles each man felt a pain in the small of his back. Both, however, could have marched on the following day if necessary." S. stated that though he had previously marched long distances with a heavy kit, he had never before felt so exhausted. Both men felt hungry; the food, however, satisfied their craving sensations. There was no perceptible action of the skin. The weather was fine and warm.

During these two days S. lost nearly 4½ lbs. in weight, whilst T. lost rather more than 1¾ lbs.

The changes in the excretion of urea were as follows: During the first twenty-four hours a decrease of 15.5 grs. was noted in each case; in the next twelve hours a further decrease of 7.7 grs. took place; whilst, during the last twelve hours, chiefly during rest at night, there was an increase of 30.86 grs. in S., and of 15.5 grs. in T.

The total excretion of urea during these two days of exercise, as compared with a similar period of rest, was an increase of about 7.7 grs. in S., and a decrease of about 11.5 grs. in T.

The total excretion of nitrogen stands thus: S. excreted more throughout the entire period, the excess over that excreted during the same period of rest being about 23 grs.; whilst T. for the first thirty-six hours excreted less than before, but made up for it during the last twelve hours, the excess being ultimately a little over 3 grs.

With regard to the other constituents of the urine, it was found that no increase took place in the amount of phosphoric acid excreted during the period of exercise, as compared with that of rest, and only a very slight increase in the sulphuric acid; whilst it appeared that, on a diet free from salt, much more chloride of sodium passed with the urine during a state of rest than of exercise.

On balancing the totals of the ingesta and egesta during this period, it was found that in both men a considerable increase took place in the egesta of the skin, lungs, and intestines.

*Fifth Period.*—The men now returned to their regulated diet and exercise. At first both were fatigued after the exertion of the previous day, and rested a good deal; and, as might have been expected, they were more hungry than they had been after the past period, and ate more largely. They almost entirely regained their lost weight in two days.

On estimating the excess of nitrogen excreted during this period, and taking into account at the same time the increased amount of nitrogen taken in the food, it appears that there is no ground for supposing that in the case of S. this excess was derived from the disintegration of muscle which had taken place during the last period. It is, however, probable that the very large excess of urea on the first day of this period, which occurred in the case of T., was really owing to an augmented elimination due to the work done. No such excess was observed in the case of S., who had had, however, a larger elimination than T. during the previous twelve hours.

A marked increase in the excretion of non-ureal nitrogen over the ureal nitrogen was noticed as a direct result of the exercise taken during the previous period. Dr. Parkes considers it probable that this nitrogen existed in the form of creatinine, and believes that the cause of the discrepancy between the results of Professors Fick and Wislicenus and his own on this point is to be found chiefly in the very short period of time over which their observations extended.

The chloride of sodium and the phosphoric acid speedily returned to their respective normal standards.

The following important conclusions may be drawn from these experiments, and those of Professors Fick and Wislicenus, with which they agree on the most important points:—

*Firstly.* That on a non-nitrogenous diet of fat, starch, and sugar, exercise produces a slight but unimportant increase in the amount of nitrogen excreted both by the kidneys and the intestines.

*Secondly.* That during the period of actual work the amount of urea is diminished, proving that changes take place which cause either a retention of the nitrogen or an elimination by another channel. It is evident, then, that the quantity of the urea excreted cannot be taken as an index of the amount of waste which the tissues have suffered.

*Thirdly.* That amount of force expended during exertion is not merely the result of the oxidation of the muscular, nervous, and other nitrogenous tissues of the body, which can, in fact, only represent about one-fifth of the entire quantity, but that a most important share in its production is taken by the non-nitrogenous (fatty and starchy) elements of the food, previous to their transformation into tissue.

*Fourthly.* That a well-fed body possesses a sufficient store of nitrogen to allow of muscular exertion being continued for some time without requiring any immediate supply, but that food will shortly be required to replace the tissues which have been destroyed, and that this food must contain some of the nitrogenous principles, either animal or vegetable—viz., albumen, fibrin, casein, gluten, &c. This last fact was very distinctly proved during the third and fifth periods of Dr. Parkes's experiment, in which not only was the exhaustion consequent upon the starvation of the nitrogenous tissues severely felt, but a very notable quantity of nitrogen was taken and retained in the body to replace the former loss.

These results, besides their purely scientific value, may teach certain useful practical lessons. Thus, in training for those exercises which require a great and sudden expenditure of force, it is a mistake to supply a too exclusively nitrogenous or meat diet, since four-fifths of the total amount of force has to be obtained from the oxidation of the non-nitrogenous elements of the food—fat, starch, sugar; whilst, on the other hand, the want of a sufficient supply of the nitrogenous elements—albumen, fibrin, and casein, etc.—leads to an inadequate renewal of the wasted muscular and nervous tissues, and the consequent formation of an imperfectly organized structure, which will be less able to bear any of the severer trials to which it may be subjected, and will ultimately lead to early degeneration and death.—*Med. Times and Gaz.*, April 13, 1867.

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4. *Cutaneous Absorption.*—M. HOFFMAN related at a recent meeting of the Academy of Sciences some experiments which he had performed on himself in illustration of the question of cutaneous absorption:—

"1. During 44 days I took 16 baths, each consisting of 300 litres of water and 250 grammes of digitalis leaves. After the third bath only, I began to feel the peculiar uneasiness proper to the action of the medicine, my pulse at the same time becoming slower by four or five beats, this condition persisting for several hours. By the eighth bath the *malaise* had increased, and my pulse had descended from its ordinary number of 68 to 61, while after the sixteenth bath it had descended to 48. It is evident, then, that the active principles of digitalis had been absorbed, but only in a slow and progressive manner. 2. Every third